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ATTORNEYS DOCKET NUMBER 740670-262

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)

09/889693

INTERNATIONAL APPLICATION NO.
PCT/JP00/08343INTERNATIONAL FILING DATE:
November 27, 2000PRIORITY DATE CLAIMED:
November 25, 1999

TITLE OF INVENTION

GROPING OPERATION APPARATUS

APPLICANT(S) FOR DO/EO/US

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Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).
4. ☒ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☒ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information:
Application Data Sheet
Eight (8) Sheets of Formal Drawings

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U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.51) 09/889693		INTERNATIONAL APPLICATION NO. PCT/JP00/08343		ATTORNEYS DOCKET NUMBER: 740670-262	
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21. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492(a)(1) - (5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO..... \$1000.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO..... \$860.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(3)) paid to USPTO \$710.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)..... \$690.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00 <div style="text-align: right;">ENTER APPROPRIATE BASIC FEE AMOUNT =</div>				CALCULATIONS		PTO USE ONLY	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$			
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE				
Total claims	13 - 20 =		X \$18.00	\$			
Independent claims	5 - 3 =	2	X \$80.00	\$160.00			
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+ \$270.00	\$		
TOTAL OF ABOVE CALCULATIONS =				\$1,020.00			
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$			
SUBTOTAL =				\$1,020.00			
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$			
TOTAL NATIONAL FEE =				\$1,020.00			
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$40.00			
TOTAL FEES ENCLOSED =				\$1,060.00			
				Amount to be refunded:	\$		
				Charged:	\$		

a. ☒ A check in the amount of \$1,060.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. 19-2380 in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 19-2380. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO

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09/889693

JC17 Rec'd PCT/PTO 20 JUL 2001

SPECIFICATION

GROPING OPERATION APPARATUS

TECHNICAL FIELD

5 [0001] The present invention relates to a groping operation apparatus for inputting a command or an instruction by touching a display screen of a display device with a finger or the like, and particularly to a groping operation apparatus that can be operated without seeing any screen.

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BACKGROUND ART

[0002] Generally, a plurality of graphics (icons) each corresponding to one action are displayed on the display screen of the display device, and the operator selects a corresponding icon to command an action (hereinafter referred to as an object action). Conventionally, it was a common practice that a transparent touch sensor (touch panel) was installed on the front face of the display screen of the display device, so that the operator could command one action by selecting an icon displayed on the display screen and touching the icon on the touch sensor with a finger.

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[0003] An operation switch for touching the icon is employed in the case of operating a navigation device or a car audio device while driving the car, for example, and has been already put to practical use.

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[0004] FIG. 7 is a view showing a method for specifying an action in the conventional groping operation apparatus. In FIG. 7, there are four icons from object action 1 to object action 4 displayed on the display screen. When it is desired to command an object action 3, for example, the operator may touch an icon of the object action 3 on the touch panel (touch sensor) 17 with a finger to select the object action 3, so that a power switch of a specific audio apparatus can be turned on in accordance with an instruction of the object action 3.

[0005] However, since the display screen may shake within the moving car, it is difficult for the user to touch an icon indicating an object action correctly while driving the car. Therefore, the operator performs an operation while keeping an eye on the screen, which is a dangerous operation as the operation during the drive, and has difficulty in specifying the object action.

[0006] As means for solving such a problem, a device for informing the user of a selected icon (graphics) by uttering a sound that is different depending on the icon selected by the operator has been disclosed in Japanese Patent Application Laid-Open No. 4-309116 gazette.

[0007] However, with the device as disclosed in Japanese Patent Application Laid-Open No. 4-309116 gazette, there is the advantage of allowing for the selection operation without seeing the display

screen, but if the selection operation of intent caused a failure, the selection operation had to be retried by confirming the failure in sound. Still, there was another problem that it took a lot of time to effect the selection operation in trial and error as described previously.

[0008] The present invention has been achieved in the light of the aforementioned problems, and it is an object of the invention to provide a groping operation apparatus that can specify an action to be commanded through the groping operation in reliable manner.

DISCLOSURE OF THE INVENTION

[0009] According to a first aspect of the present invention, there is provided a groping operation apparatus including: a display device having a display screen; a touch panel, which is provided on the display screen, for outputting the positional information indicating a contact point on the touch panel that is touched by the operator; specifying means for specifying an action commanded by the operator touching the touch panel in accordance with the positional information; and control means for outputting a control signal in accordance with an output of the specifying means, wherein the specifying means detects the contact point moved from one end portion of the touch panel to another end portion, with the end portions being located at four corner areas of the touch panel, on the basis of the positional information, and the action commanded by the

operator is specified from a movement start end portion and a movement termination end portion of the detected contact point.

[0010] According to this invention, a contact start point and a contact termination point on the touch panel are limited to the four corner areas of the touch panel. Accordingly, after the operator knows the position on the display screen by grope, an action to be commanded can be correctly passed to the specifying means by moving a finger approximately on the touch panel without seeing the display screen. Since the four corner end portions can be groped and found relatively correctly in a sense of touch with hand, and the contact start point and the contact termination point cannot be detected at an area other than the four corner end portions, it is possible to suppress the possibility of misoperation even in the time of driving the car.

[0011] According to a second aspect of the invention, there is provided a groping operation apparatus including: a display device having a display screen; a touch panel, which is provided on the display screen, for outputting the positional information indicating a contact point on the touch panel that is touched by the operator; specifying means for specifying an action commanded by the operator touching the touch panel in accordance with the positional information; and control means for outputting a control signal in accordance with an output of the specifying means, wherein the

specifying means detects the contact point moved from one end portion of the touch panel to another end portion, with the end portions being located at an almost central area and four corner areas of the touch panel, on the basis of the positional information, and the action commanded by the operator is specified from a movement start end portion and a movement termination end portion of the detected contact point.

[0012] According to this invention, a contact start point and a contact termination point on the touch panel are limited to the central area and four corner areas of the touch panel. The central area of the touch panel can be easily known from the shape of a peripheral portion in the display screen. Accordingly, the operator can pass an action to be commanded to the specifying means correctly by moving a finger on the touch panel approximately without seeing the display screen, after knowing the position of the display screen by grope. Since the five end portions can be groped and found relatively correctly in a sense of touch with hand, and the contact start point and the contact termination point cannot be detected at an area other than the five end portions, it is possible to suppress the possibility of misoperation while driving the car.

[0013] According to a third aspect of the invention, there is provided a groping operation apparatus including: a display device having a display screen; a touch panel, which is provided on the display

screen, for outputting the positional information indicating a contact point on the touch panel that is touched by the operator; specifying means for specifying an action commanded by the operator touching the touch panel in accordance with the positional information; and
5 control means for outputting a control signal in accordance with an output of the specifying means, wherein the specifying means detects the contact point moved along a peripheral portion of the display screen, on the basis of the positional information, and the action commanded by the operator is specified from a movement start
10 position and a movement termination position of the detected contact point.

[0014] According to this invention, a contact start point and a contact termination point on the touch panel are limited to a
15 predetermined movement area of the touch panel and detected. The movement area is the peripheral portion of the display screen, and the peripheral portion of the display screen is often provided with a member such as a frame, which can serve as a guide, when the contact point is moved, making it possible to move the contact point
20 correctly. Even if there is no frame, the peripheral portion of the display screen can be correctly known in a sense of touch with hand.

[0015] Accordingly, the operator can pass an action to be commanded to the specifying means correctly by moving a finger on
25 the touch panel along the peripheral portion of the display screen

approximately without seeing the display screen, after knowing the position of the display screen by grope. Since the movement area is the peripheral portion of the display screen and the touch panel, the operator can know correctly the movement area in a sense of touch but not visually, so that it is possible to suppress the possibility of misoperation while driving the car.

[0016] According to a fourth aspect of the invention, there is provided the groping operation apparatus as defined in any one of the first to third inventions, wherein the specifying means specifies the action commanded by the operator from the number of movements of the detected contact point.

[0017] According to this invention, the action to be commanded can be passed to the specifying means correctly by moving a finger on the touch panel approximately without seeing any display screen in the same manner as the first and second inventions, and can be selected from among more kinds of actions by repeating the movement operation of the contact point.

[0018] Herein, the specifying means stores a movement to action correspondence table in which each action is associated with a combined content of the information of the movement start position and the movement termination position and the number of movements. And the specifying means specifies the instructed

action from the analysis result of the movement of the contact point and the movement to action correspondence table, and supplies its result to the control device.

5 [0019] According to a fifth aspect of the invention, there is provided the groping operation apparatus as defined in any one of the first to fourth inventions, wherein the specifying means specifies the action commanded by the operator from the movement speed of the detected contact point.

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[0020] According to this invention, the action to be commanded can be passed to the specifying means correctly by moving a finger on the touch panel approximately without seeing any display screen in the same manner as the first to third inventions, and can be selected
15 from among more kinds of actions by combining the number of movements of the contact point and the movement speed of the contact point.

[0021] Herein, the specifying means stores a movement to action
20 correspondence table in which each action is associated with a combined content of the information of the movement start position and the movement termination position, the information of the number of movements, and the information of the movement speed. And the specifying means specifies the instructed action from the
25 analysis result of the movement of the contact point and the

movement to action correspondence table, and supplies the specified result to the control device.

[0022] According to a sixth aspect of the invention, there is provided

5 a groping operation apparatus including: a display device having a display screen; a touch panel, which is provided on the display screen, for outputting the positional information indicating a contact point on the touch panel that is touched by the operator; specifying means for specifying an action commanded by the operator touching
10 the touch panel in accordance with the positional information; and control means for outputting a control signal in accordance with an output of the specifying means, wherein the specifying means detects the contact point moved on the touch panel on the basis of the positional information, calculates a movement direction of the contact point from a movement start position and a movement termination
15 position of the detected contact point, and specifies the action commanded by the operator on the basis of the calculated movement direction.

20 [0023] According to this invention, a contact start point and a contact termination point on the touch panel are detected and stored to know the movement direction, but when the contact point is moved from left to right on the touch panel, for example, it does not matter whether the movement occurs on the top or the bottom of the

touch panel 17. That is, the position in a vertical direction is not regarded.

[0024] The allowable movement direction is predetermined in the horizontal direction and the vertical direction, for example, and when the actual movement of the contact point is not precisely vertical or horizontal, it is judged to belong to either one of the horizontal and vertical movement directions that is closer to that actual movement direction.

[0025] Since the movement direction of the contact point is only detected in the predetermined direction, the operator can pass an action to be commanded to the specifying means correctly by moving a finger on the touch panel approximately without seeing any display screen, after knowing the position of the display screen by grope. Therefore, it is possible to suppress the possibility of misoperation while driving the car.

[0026] According to a seventh aspect of the invention, there is provided the groping operation apparatus as defined in the sixth invention, wherein the specifying means specifies the action commanded by the operator from the number of movements of the detected contact point.

[0027] According to this invention, the action to be commanded can be passed to the specifying means correctly by moving a finger on the touch panel approximately without seeing any display screen in the same manner as the sixth invention, and can be selected from among
5 more kinds of actions by repeating the movement operation of the contact point.

[0028] According to an eighth aspect of the invention, there is provided the groping operation apparatus as defined in the sixth or
10 seventh invention, wherein the specifying means specifies the action commanded by the operator from the movement speed of the detected contact point.

[0029] According to this invention, the action to be commanded can
15 be passed to the specifying means correctly by moving a finger on the touch panel approximately without seeing any display screen in the same manner as the sixth invention, and can be selected from among more kinds of actions by combining the number of movements and the movement speed of the contact point.

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[0030] According to a ninth aspect of the invention, there is provided a groping operation apparatus including: a display device having a display screen; a touch panel, which is provided on the display screen, for outputting the positional information indicating a contact
25 point on the touch panel that is touched by the operator; specifying

means for specifying an action commanded by the operator touching the touch panel in accordance with the positional information; and control means for outputting a control signal in accordance with an output of the specifying means, wherein in that the specifying means

5 detects the contact point that is moved along a peripheral portion of the display screen to an end portion of the touch panel after being moved on the touch panel from an area other than the peripheral portion of the touch panel to the peripheral portion of the touch panel, with the end portions being located at four corner areas of the touch
10 panel, on the basis of the positional information, and specifies the action commanded by the operator from a movement start position in the peripheral portion and a movement termination position of the detected contact point.

15 [0031] According to a tenth aspect of the invention, there is provided the groping operation apparatus as defined in the ninth invention, wherein the control means sends out a control signal in accordance with an output from the specifying means to the electrical device mounted on the vehicle.

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[0032] According to an eleventh aspect of the invention, there is provided the groping operation apparatus as defined in the tenth invention, wherein the control means sends out a control signal in accordance with an output from the specifying means to the acoustic

device mounted on the vehicle to adjust the sound volume of the acoustic device.

[0033] According to a twelfth aspect of the invention, there is
5 provided the groping operation apparatus as defined in the tenth
invention, wherein the control means sends out a control signal in
accordance with an output from the specifying means to the acoustic
device mounted on the vehicle to instruct a track number of the
recording medium which the acoustic device records or reproduces.

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[0034] According to a thirteenth aspect of the invention, there is
provided the groping operation apparatus as defined in any one of the
ninth to twelfth inventions, wherein when the movement of the
contact point in the peripheral portion of the touch panel occurs in a
15 longitudinal direction of the touch panel, the control means outputs a
control signal for increasing or decreasing a set value of the electrical
device connected to the groping operation apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

20 [0035] FIG. 1 is a view showing a method for specifying an action in
a groping operation apparatus according to a first embodiment of the
present invention;

[0036] FIG. 2A is a block diagram of the groping operation
25 apparatus according to the invention;

[0037] FIG. 2B is a schematic flowchart showing a procedure of the groping operation apparatus as shown in FIG. 2A, including a procedure of outputting a control signal to a control object device and inputting a display data from a control object device;

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[0038] FIG. 2C is a simplified flowchart showing a part of a procedure with an operation for the groping operation apparatus of the invention;

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[0039] FIG. 2D is a diagram for explaining a touch position of a touch panel 17 in the operation as indicated in the simplified flowchart of FIG. 2C;

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[0040] FIG. 3 is a view showing a movement area of a contact point in a groping operation apparatus according to a second embodiment of the invention;

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[0041] FIG. 4 is a view showing a method for specifying an action in the groping operation apparatus according to the second embodiment of the invention;

[0042] FIG. 5 is a view showing a method for specifying an action in a groping operation apparatus according to a third embodiment of the invention;

[0043] FIGS. 6A and 6B are each an example of a movement to action correspondence table stored in specifying means in the groping operation apparatus of the invention;

5 [0044] FIG. 6C is a view showing the movement direction of FIGS. 6A and 6B; and

[0045] FIG. 7 is a view showing a method for specifying the action in the conventional groping operation apparatus.

BEST MODE FOR CARRYING OUT THE INVENTION

10 [0046] FIG. 2A is a block diagram of a groping operation apparatus according to the invention, and FIG. 2B is a flowchart schematically showing a procedure of the groping operation apparatus. As shown
15 in FIGS. 2A and 2B, a groping operation apparatus 10 comprises a display device 11 having a display screen 25, a touch panel 17 provided on the display screen 25, specifying means 13 for specifying an action commanded by a operator's touching the touch panel 17, and control means 15 for outputting a control signal in accordance
20 with an output of the specifying means 13.

[0047] The touch panel 17 is provided on the display screen 25. When the operator touches the touch panel 17 in the groping operation apparatus 10, the data is input from the touch panel 17
25 (S201). The input data is converted into the coordinate data (S202),

and the coordinate data, or the positional information indicating the contact point on the touch panel, is output to the specifying means 13.

5 [0048] The specifying means 13 specifies an action commanded by the operator touching the touch panel 17 in accordance with the positional information, and outputs it to the control means 15. The control means 15 supplies the control information to a control object device such as a car audio in accordance with the specified action
10 (S203). This control object device performs a corresponding processing on the basis of the control information, and outputs the display data to the display device 11 (as indicated by the arrow of the broken line in FIG. 2A) (S204). The display device 11 outputs the display data to the display screen 25 to display the display data
15 (S205). Also, the control means 15 controls the display device 11 with the display contents and the display timing and the specifying means 13 with the contact point or the movement detection start and the movement detection termination. If the action instructed by the operator is specified by the specifying means 13, its result is sent to
20 the display device 11, and displayed on the display screen 25. In this case, the operator may also recognize the specified action in voice. If the action instructed by the operator is not specified by the specifying means 13, the alarm sound is produced by the loudspeaker, and its result is sent to the display device 11 and
25 displayed on the display screen 25.

[0049] Further, the specifying means 13 stores a movement to action correspondence table in which each action is associated with a combined content of the information of the movement start position and the movement termination position, the number of movements, and the movement speed. And the specifying means 13 specifies the instructed action by the operator from the analysis result of the movement of the contact point and the movement to action correspondence table, and supplies its result to the control means 15. Herein, one example of the movement to action correspondence table is shown in FIGS. 6A and 6B, and the movement direction as indicated in the table is shown in FIG. 6C. In FIG. 6A, the movement operation and the action are shown at the time of the CD-CH control. For example, if an operation ① is performed as shown in FIG. 6C, the track down is specified as the action. Also, in FIG. 6B, the movement operation and the action are shown at the time of the tuner control. For example, if an operation ⑤ ⑦ is performed as shown in FIG. 6C, the volume up is specified as the action.

[0050] Referring now to FIGS. 2B and 2C, a part of the procedure for the groping operation apparatus of the invention with an operation will be briefly described below. As shown in FIG. 2C, if the operator turns the touch panel 17 from off to on (S301, S302), it is determined whether or not any of the positions ① to ④ (see FIG. 2D) is touched (S303). If position ① is touched, it is then determined whether or

not position ⑤ or ⑥ is touched (S304). If position ⑤ is touched, a control signal corresponding to position ⑤ is output from the control means 15 to a control object device. And after outputting the control signal, the touch condition of position ⑤ is judged (S306). If the touch condition is maintained for a fixed time (Yes in S307), the control signal corresponding to position ⑤ is output again, while if the touch condition is released before the elapse of the fixed time (No in S307), the procedure returns to S306. In case of No in S303, it is determined whether or not the touch panel is turned off or a multiplicity of positions are touched (S308). Then, the procedure returns to S303 if No in S308, or returns to S301 if Yes in S308. Also, in case of No in S304, it is determined whether or not the condition of position ① is kept (S309). The procedure returns to S304 if Yes in S309, or returns to S301, if No in S309, including the condition where the touch panel is off or a multiplicity of positions are touched. Note that the processing following S303 in FIG. 2C is only shown in the case of position ① for the simpler explanation, because the subsequent processing in each case of positions ① to ④ is considered to be the same. Similarly, the processing following S304 is only shown in the case of position ⑤.

[0051] Referring now to FIGS. 1 and 2A-2D, the groping operation apparatus according to the first embodiment of the invention will be described below. FIG. 1 is a view showing a method for specifying an action in the groping operation apparatus according to the first

embodiment of the invention. In FIG. 1, the end portions A, B, C and D are set up at four corners of the touch panel 17. The four end portions serve to indicate the corner of the panel, the area of each end portion being set wide enough. And if the operator moves a finger on the touch panel 17 while touching the touch panel with the finger, the specifying means 13 judges that the contact point has been moved from the positional information output from the touch panel 17. Herein, the point at which the movement of the contact point is started, or the movement start position, and the point at which the movement of the contact point is terminated, or the movement termination position, are judged to belong to the closest end portion among the four end portions, on the basis of the positional information output from the touch panel 17, and stored as the movement start end portion and the movement termination end portion in the specifying means 13, respectively.

[0052] For example, when the contact point is moved from end portion A to end portion B, as shown in FIG. 1, it is judged that the first object action is commanded by the operator. When the contact point is moved from end portion C to end portion B, it is judged that the eighth object action is commanded by the operator. In this way, the first to twelfth object actions are specified in accordance with the fact that the contact point is moved from which end portion to which end portion.

[0053] As described previously, the end portions are set up at four corners of the touch panel 17, in which each end portion is set to be a wide area having a predetermined area, but not a narrow area, and when the movement of the contact point is started or terminated near
5 the area, the start point or termination point is judged to be within the closest end portion.

[0054] Also, a total of five areas, including the four corner areas of the touch panel as the end portions, and a central area of the touch
10 panel as one end portion, may be defined as the end portions, in which case one object action can be commanded from among more object actions to be instructed.

[0055] The specifying means 13 stores the time taken for the
15 movement, and the number of movements. And the object action to be commanded (selected) may be assigned in accordance with the number of movements of the contact point, whereby the number of object actions to be selected can be increased above 12. Also, the object action to be commanded (selected) may be assigned, depending
20 on whether the movement speed of the contact point is fast or slow, whereby the number of object actions to be selected can be increased above 12. Further, the object action to be commanded (selected) may be assigned in accordance with the number of movements and the movement speed of the contact point, whereby the number of
25 object actions to be selected can be more increased.

[0056] A groping operation apparatus according to the second embodiment of the invention will be described below with reference to FIGS. 3 and 4. FIG. 3 is a view showing the movement area of the contact point in the groping operation apparatus according to the second embodiment of the invention. The block diagram of the groping operation apparatus according to the second embodiment is the same as shown in FIG. 2.

[0057] As shown in FIG. 3, a marginal portion 21 is located outside the touch panel 17, and is composed of a frame provided outside the display screen 25. A peripheral portion of the touch panel 17 is a movement area 23 as indicated by the slanting line, and the movement of the contact point occurs within the movement area. The movement area 23 is located about 2 cm inside from the outermost periphery of the touch panel 17, and the operator can move the contact point within the movement area 23 easily and correctly by moving a finger along the marginal portion 21 because the marginal portion 21 serves as a guide, even while driving the car.

[0058] That is, the groping operation apparatus according to the second embodiment of the invention is the same as that of the first embodiment, and comprises a display device 11 having a display screen 25, a touch panel 17, which is provided on the display screen 25, for outputting the positional information indicating the contact point on the touch panel, specifying means 13 for specifying an

action commanded by the operator touching the touch panel, and control means 15 for outputting a control signal in accordance with an output of the specifying means.

5 [0059] However, the groping operation apparatus according to the second embodiment of the invention is different from that of the first embodiment in that the contact point moved along the peripheral portion of the display screen 25 is detected in the specifying means 13 on the basis of the positional information output from the touch panel 17, and the object action commanded by the operator is specified from the movement start position and the movement termination position of the detected contact point.

10 [0060] FIG. 4 is a view showing a method for specifying an action in the groping operation apparatus according to the second embodiment of the invention. As shown in FIG. 4, the end portions A, B, C and D are set up at four corners of the touch panel 17 in the same manner as in the first embodiment. For example, when the contact point is moved from end portion A to end portion B, it is judged by the specifying means 13 that the action 1 is commanded by the operator.

15

20 When the contact point is moved from end portion B to end portion A, it is judged by the specifying means 13 that the action 5 is commanded by the operator. As shown in FIG. 4, in the case where the movement start position or movement termination position is set

at any of the four corner end portions of the touch panel 17, one object action among actions 1 to 8 can be commanded.

[0061] The movement of the contact point is limited within the movement area 23. However, the movement start position and the movement termination position of the contact point are not limited to the four end portions, but the movement start position or movement termination position of the contact point can be set between end portion A and end portion B, for example. Thereby, the number of object actions to be selected (commanded) can be increased above 8. Herein, the movement of the contact point is detected in the specifying means 13 on the basis of the positional information output from the touch panel 17, the information as to the movement start position and the movement termination position is stored in the specifying means 13, and the object action to be commanded by the operator can be specified from the information as to the movement start position and the movement termination position.

[0062] The specifying means 13 stores the time taken for the movement of the contact point, and the number of movements of the contact point. And the object action to be commanded (selected) may be assigned in accordance with the number of movements of the contact point, whereby one object action can be selected (commanded) from among more object actions. Also, the object action to be commanded (selected) may be assigned, depending on

whether the movement speed of the contact point is fast or slow, whereby the number of object actions to be selected can be more increased. Further, the object action to be commanded (selected) may be assigned in accordance with the number of movements and
5 the movement speed of the contact point, whereby the number of object actions to be selected can be more increased.

[0063] A groping operation apparatus according to the third embodiment of the invention will be described below with reference to
10 FIG. 5. FIG. 5 is a view showing a method for specifying an action in the groping operation apparatus according to the third embodiment of the invention. The block diagram of the groping operation apparatus according to the third embodiment is the same as shown in FIG. 2.

15 [0064] As shown in FIG. 5, the movement direction of the contact point is detected in the groping operation apparatus according to the third embodiment of the invention, in which an object action corresponding to the detected direction is recognized as to be the
20 object action selected (commanded) by the operator. Herein, since the movement direction of the contact point is detected, the operator only needs to move a finger without worrying about the absolute position on the touch panel, whereby the operator can command the object action easily and correctly, even while driving the car.

[0065] That is, in the groping operation apparatus according to the third embodiment of the invention, the movement of the contact point is not limited within the movement area 23 as in the second embodiment. Also, the movement start position and the movement termination position of the contact point are obtained from the positional information output from the touch panel 17, and stored in the specifying means 13.

[0066] In the specifying means 13, the movement direction of the contact point is detected from the information of the movement start position and the movement termination position of the contact, in which one object action is selected from among the predetermined object actions corresponding to the movement direction. For example, if the action 1 is defined for the movement from left to right, the action 2 for the movement from right to left, the action 3 for the movement from top to bottom, and the action 4 for the movement from bottom to top, one object action can be selected (commanded) from among four object actions.

[0067] The specifying means 13 stores the time taken for the movement of the contact point, and the number of movements of the contact point. And the object action to be commanded (selected) may be assigned in accordance with the movement direction and the number of movements of the contact point, whereby the number of object actions to be selected can be increased above 4. Also, the

object action to be commanded (selected) may be assigned in accordance with the movement direction, the number of movements, and the movement speed of the contact point, whereby the number of object actions to be selected can be more increased.

5

[0068] When the movement of the contact point is detected by the specifying means 13, the movement of the contact point is recognized to be started at a moment when the operator touches the touch panel 17 with a finger, and the movement is judged to be terminated at a moment when the finger moving on the touch panel is left from the touch panel. When the next movement is started immediately after that, for example, within two seconds, the movement is judged to be not by a new command, but one command including the previous movement. Accordingly, when the operator makes one command by repeating the movement of the contact point, the next movement action is started within two seconds after one movement action, and when the next command is issued after one command is terminated, the next command is started after the elapse of two seconds or more from the previous command.

20

[0069] Also, when the movement of the contact point is detected by the specifying means 13, the movement of the contact point may be recognized to be started at a moment when the operator's finger touches the touch panel 17 and is moved, and the movement may be

judged to be terminated at a moment when the movement of the finger is stopped.

[0070] As described above, with the groping operation apparatus of the invention, if the operator gropes the position of the display screen by hand and moves a finger on the touch panel without seeing the display screen, the object action can be commanded. Therefore, the operator can easily control the device connected to this groping operation apparatus, even while driving the car, for example.

[0071] A groping operation apparatus according to the fourth embodiment of the invention will be described below, exemplifying an operation panel for the car-mounted electrical device employing the groping operation apparatus.

[0072] When the operator who is driving the car operates the electrical device mounted on the car, the operator touches the touch panel with a finger without seeing the display screen. Assuming that the firstly touched area is other than the movement area 23 as shown in FIG. 3, the operator firstly moves the finger to the peripheral portion (movement area) of the touch panel 17. This operation can be easily effected because the marginal portion 21 outside the movement area 23 serves as a stopper. And the operator moves the finger to any of the end portions as indicated by A, B, C and D in FIG.

4, while tracing the movement area 23 (peripheral portion of the touch panel) with the finger.

[0073] An operation of the operator is detected by the groping
5 operation apparatus 10 in the following way. Then, a control signal is sent from the control means 15 to the car-mounted acoustic device connected to the groping operation apparatus 10.

[0074] That is, the specifying means 13 detects the contact point
10 being moved along the movement area (peripheral portion) 23 of the display screen to the end portion of the touch panel, after being moved from an area other than the movement area (peripheral portion) 23 of the touch panel 17 to the peripheral portion of the touch panel, on the basis of the positional information, with end
15 portions being located at four corner areas A, B, C and D of the touch panel. And an action commanded by the operator is specified from the movement start position in the peripheral portion and the movement termination position of the detected contact point.

20 [0075] The control means 15 sends out a control signal in accordance with an output from the specifying means 13, for example, a control signal for adjusting the sound volume to increase or decrease the sound volume of the acoustic device, to the acoustic device mounted on the car. In this case, the sound volume is
25 adjusted by the time for which any of the four corners is pressed, as

indicated at S306 and S307 in FIG. 2C. That is, a volume one step command is output as the control signal, and thereafter if the same area is kept pressed even after the elapse of 500 ms, the volume one step up command is output again. Note that some actions such as
5 attenuation ON hardly change even though the control signal is output repeatedly, in which the control signal may be output only once even though any of the four corners is kept pressed.

10 [0076] In the case of controlling the acoustic device by sending a control signal to the acoustic device, the control means 15 outputs the control signal for increasing or decreasing the set value of the electrical device connected to the groping operation apparatus 10, when the movement of the contact point in the peripheral portion 23 of the touch panel 17 occurs in the longitudinal direction of the touch
15 panel 17, for example.

20 [0077] Particularly for the device for outputting the voice, when the movement of the contact point is made upwards on the touch panel, the volume is increased, while when the movement of the contact point is made downwards on the touch panel, the volume is decreased. Hence, the operator can perform the operation in a sense that the touch panel is an operation panel for the acoustic device.

25 [0078] Also, for the device for reproducing the recording medium to output the voice, the control means 15 sends out a control signal in

accordance with the selected command to the acoustic device connected to the groping operation apparatus 10, thereby instructing a track number of the recording medium on which the acoustic device records or reproduces.

CLAIMS

1. A groping operation apparatus, comprising:

a display device having a display screen;

5 a touch panel, which is provided on the display screen, for outputting the positional information indicating a contact point on the touch panel that is touched by the operator;

specifying means for specifying an action commanded by the operator touching the touch panel in accordance with the positional
10 information; and

control means for outputting a control signal in accordance with an output of said specifying means,

wherein in that said specifying means detects said contact point moved from one end portion of said touch panel to another end
15 portion, with the end portions located at four corner areas of said touch panel, on the basis of said positional information, and said action commanded by said operator is specified from a movement start end portion and a movement termination end portion of said detected contact point.

20

2. A groping operation apparatus, comprising:

a display device having a display screen;

a touch panel, which is provided on said display screen, for outputting the positional information indicating a contact point on
25 said touch panel that is touched by the operator;

specifying means for specifying an action commanded by the operator touching said touch panel in accordance with the positional information; and

control means for outputting a control signal in accordance
5 with an output of said specifying means,

wherein said specifying means detects said contact point moved from one end portion of said touch panel to another end portion, with the end portions located at an almost central area and four corner areas of said touch panel, on the basis of said positional information,
10 and said action commanded by said operator is specified from a movement start end portion and a movement termination end portion of said detected contact point.

3. A groping operation apparatus, comprising:

15 a display device having a display screen;

a touch panel, which is provided on said display screen, for outputting the positional information indicating a contact point on said touch panel that is touched by the operator;

specifying means for specifying an action commanded by the
20 operator touching said touch panel in accordance with the positional information; and

control means for outputting a control signal in accordance with an output of said specifying means,

wherein said specifying means detects said contact point moved
25 along a peripheral portion of said display screen, on the basis of said

positional information, and said action commanded by said operator is specified from a movement start position and a movement termination position of said detected contact point.

5 4. The groping operation apparatus according to claim 1, wherein said specifying means specifies said action commanded by the operator from the number of movements of the detected contact point.

10 5. The groping operation apparatus according to claim 1, wherein said specifying means specifies said action commanded by the operator from the movement speed of the detected contact point.

15 6. A groping operation apparatus, comprising:
a display device having a display screen;
a touch panel, which is provided on said display screen, for outputting the positional information indicating a contact point on said touch panel that is touched by the operator;
specifying means for specifying an action commanded by the
20 operator touching said touch panel in accordance with the positional information; and
control means for outputting a control signal in accordance with an output of said specifying means,
wherein said specifying means detects said contact point moved
25 on said touch panel on the basis of the positional information,

calculates a movement direction of said contact point from a movement start position and a movement termination position of said detected contact point, and specifies the action commanded by the operator on the basis of said calculated movement direction.

5

7. The groping operation apparatus according to claim 6, wherein said specifying means specifies the action commanded by the operator from the number of movements of the detected contact point.

10

8. The groping operation apparatus according to claim 6, wherein said specifying means specifies the action commanded by the operator from the movement speed of the detected contact point.

15

9. A groping operation apparatus, comprising:

a display device having a display screen;

a touch panel, which is provided on said display screen, for outputting the positional information indicating a contact point on said touch panel that is touched by the operator;

20

specifying means for specifying an action commanded by the operator touching said touch panel in accordance with the positional information; and

control means for outputting a control signal in accordance with an output of said specifying means,

wherein said specifying means detects said contact point that is moved along a peripheral portion of said display screen to an end portion of said touch panel after being moved on said touch panel from an area other than the peripheral portion of said touch panel to the peripheral portion of said touch panel, with the end portions located at four corner areas of said touch panel, on the basis of said positional information, and specifies the action commanded by the operator from a movement start position in said peripheral portion and a movement termination position of said detected contact point.

10. The groping operation apparatus according to claim 9, wherein said control means sends out a control signal in accordance with an output from said specifying means to the electrical device mounted on the vehicle.

11. The groping operation apparatus according to claim 10, wherein said control means sends out a control signal in accordance with an output from said specifying means to the acoustic device mounted on the vehicle to adjust the sound volume for the acoustic device.

12. The groping operation apparatus according to claim 10, wherein said control means sends out a control signal in accordance with an output from said specifying means to the acoustic device mounted on the vehicle to instruct a track number of the recording medium on which the acoustic device records or reproduces.

13. The groping operation apparatus according to claim 9, wherein when the movement of the contact point in the peripheral portion of said touch panel occurs in a longitudinal direction of said touch panel, said control means outputs a control signal for increasing or decreasing a set value of the electrical device connected to said groping operation apparatus.

5

[illegible]

ABSTRACT

A groping operation apparatus is provided in which a command action can be specified by groping operation in reliable way. The
5 groping operation apparatus includes a display device 11 having a display screen 25; a touch panel 17, which is provided on the display screen, for outputting the positional information indicating a contact point on the touch panel that is touched by the operator; specifying means 13 for specifying an action commanded by the operator
10 touching the touch panel in accordance with the positional information; and control means 15 for outputting a control signal in accordance with an output of the specifying means. The specifying means detects the contact point moved from one end portion of the touch panel to another end portion, with the end portions located at
15 four corner areas of the touch panel, on the basis of the positional information. The action commanded by the operator is specified from a movement start end portion and a movement termination end portion of the detected contact point.

FIG. 1

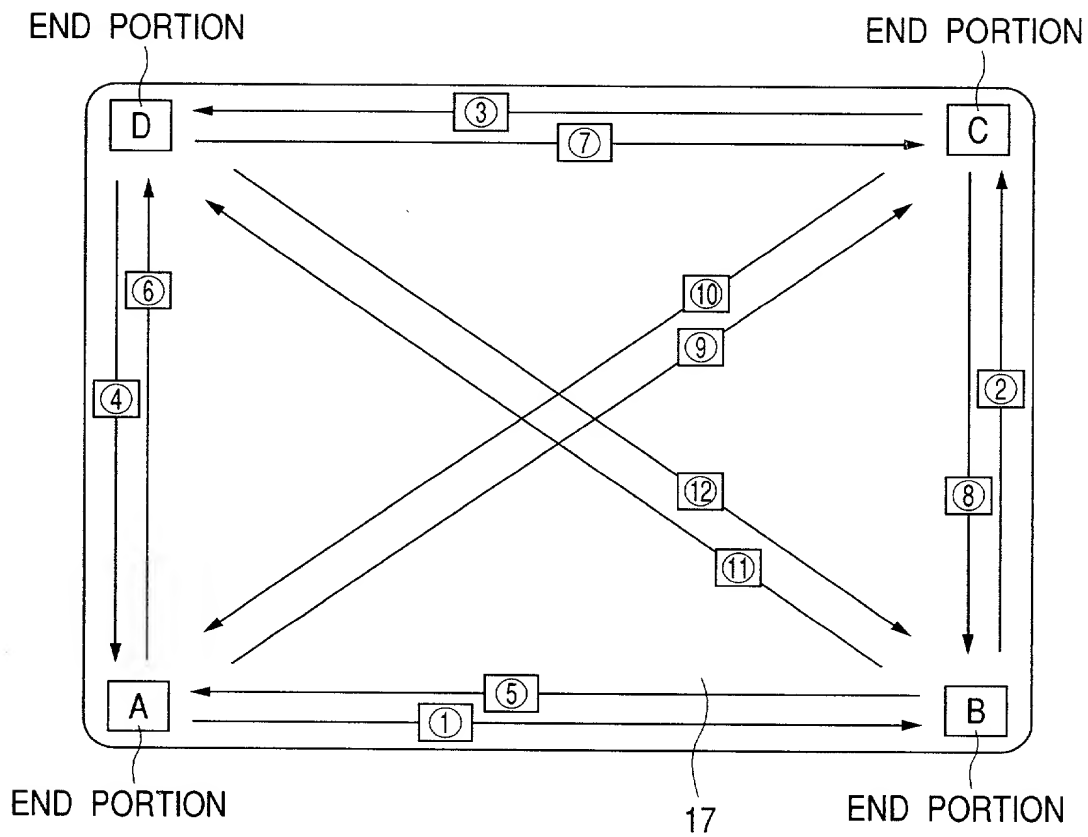


FIG. 2A

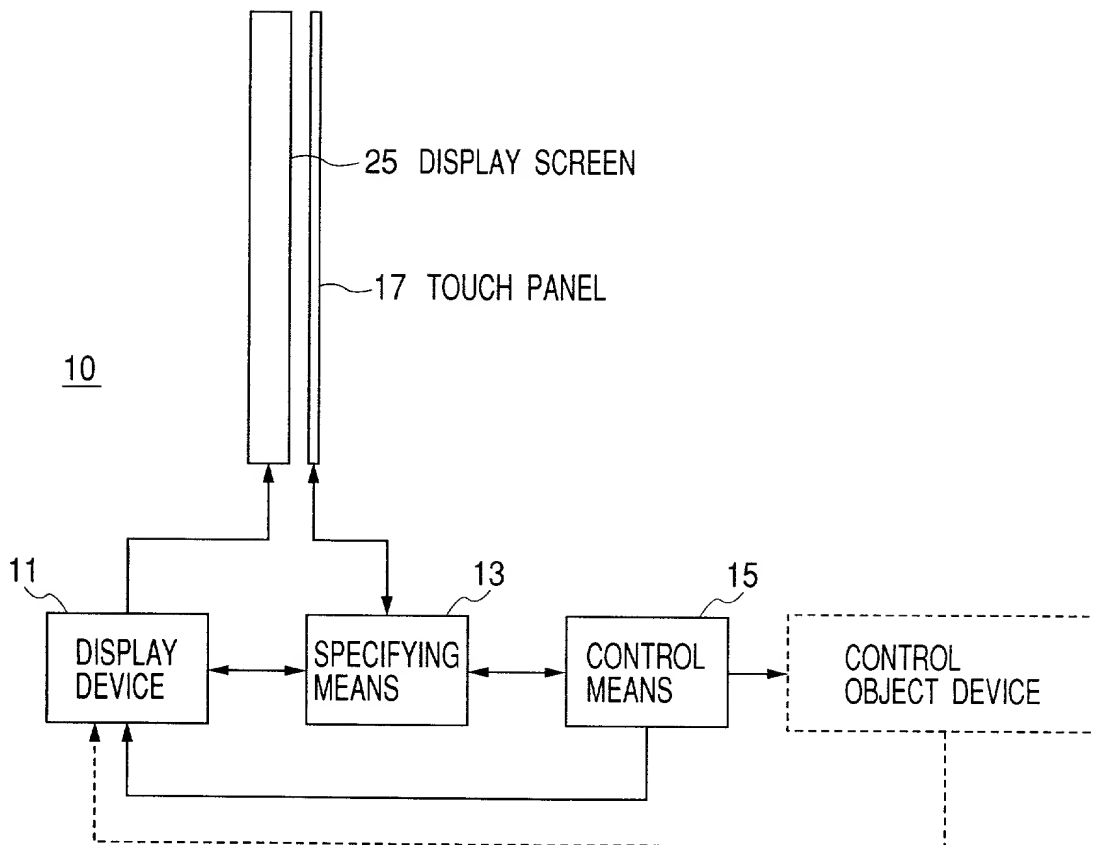


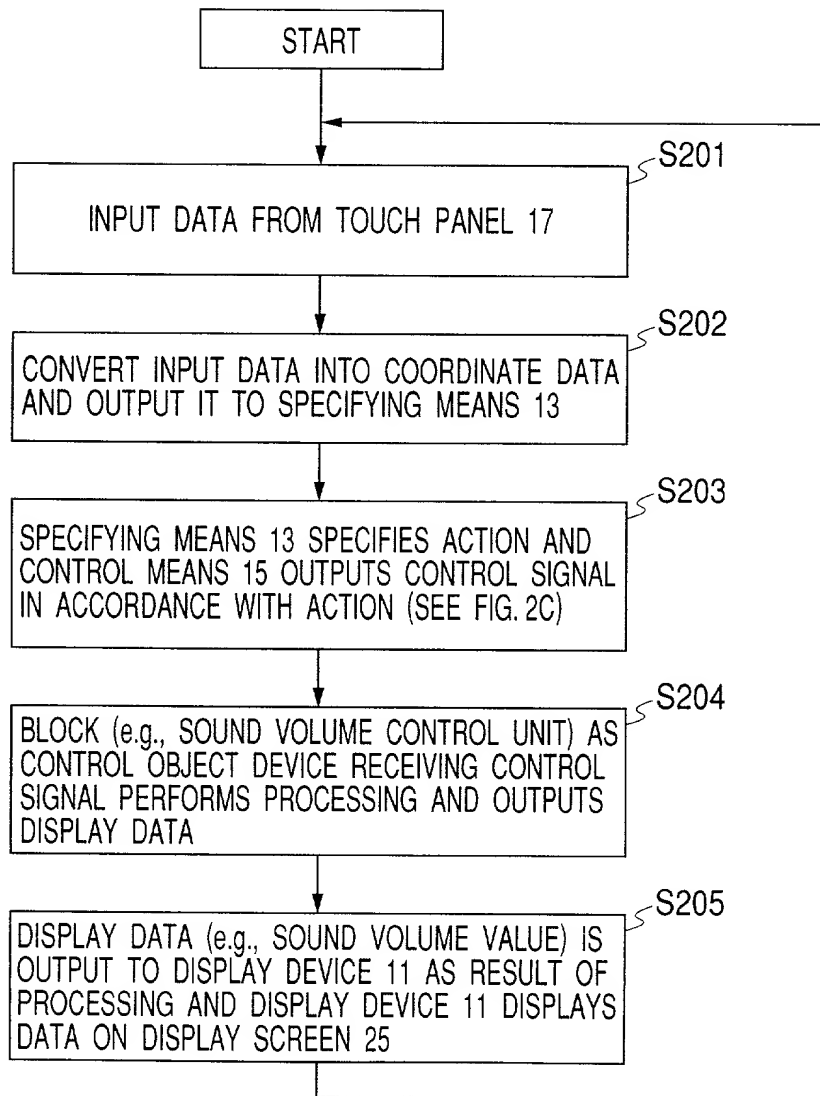
FIG. 2B

FIG. 2C

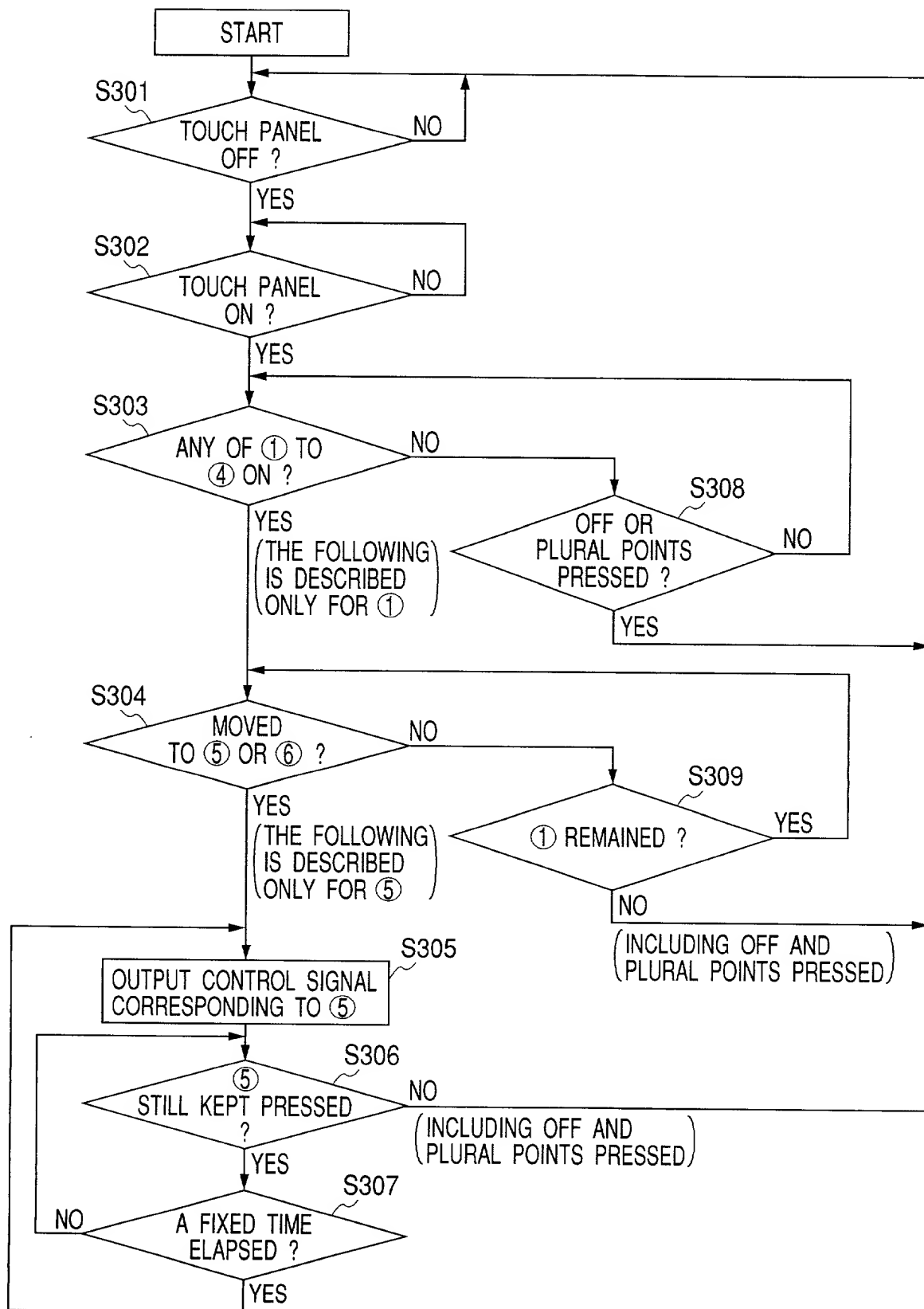
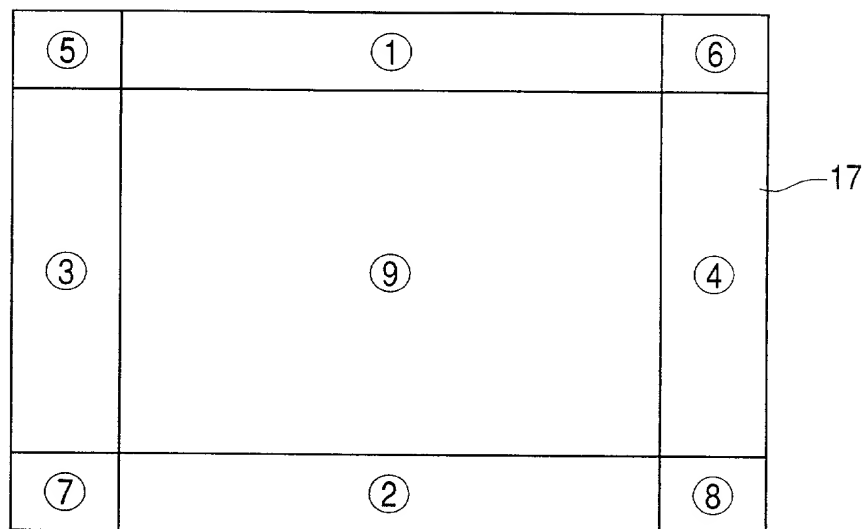
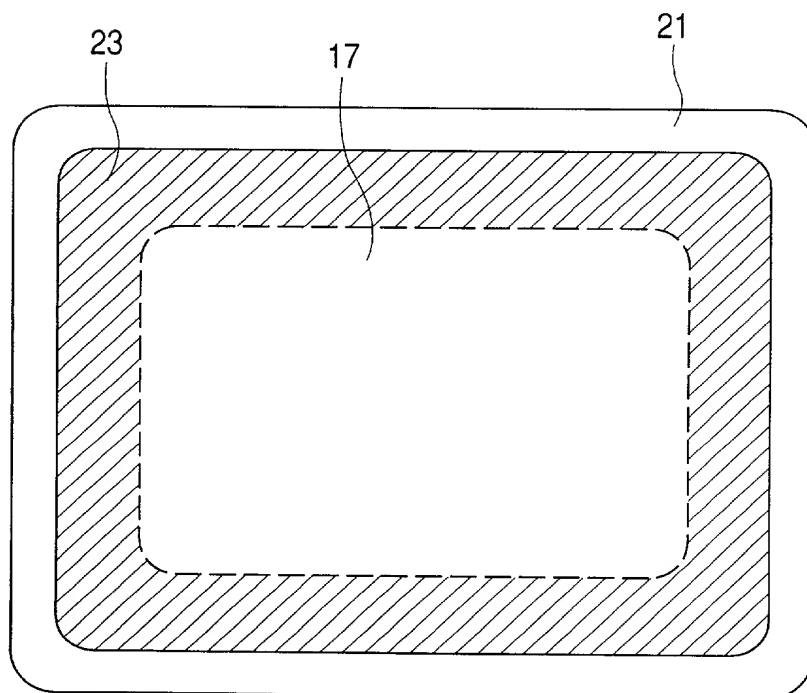


FIG. 2D*FIG. 3*

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FIG. 4

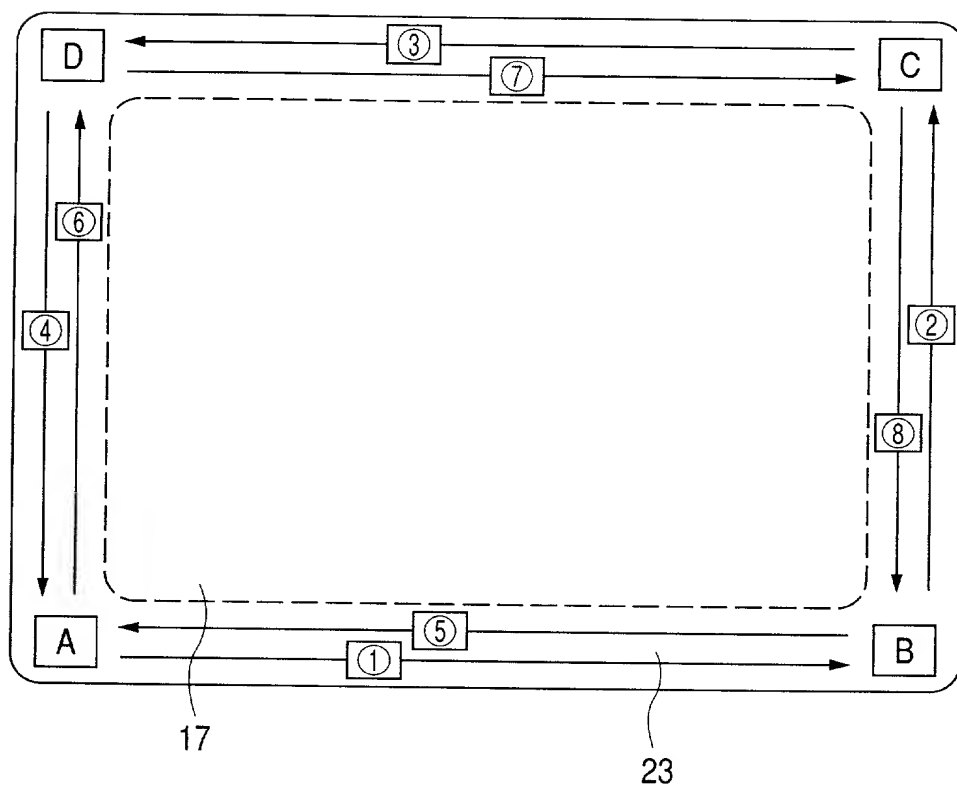


FIG. 5

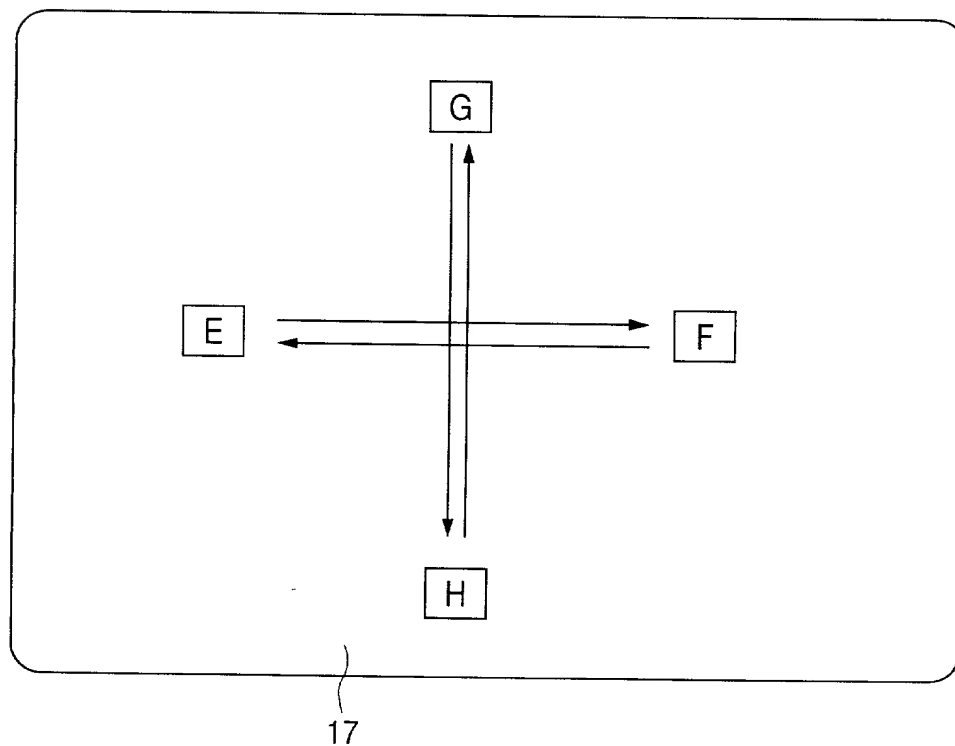


FIG. 6A

AT THE TIME OF CD-CH CONTROL

OPERATION	ACTION
①	TRACK DOWN
②	TRACK UP
③	DISK DOWN
④	DISK UP
⑤ ⑦	VOLUME UP
⑥ ⑧	VOLUME DOWN

FIG. 6B

AT THE TIME OF TUNER CONTROL

OPERATION	ACTION
①	SEEK DOWN
②	SEEK UP
③	AM BAND SWITCH
④	FM BAND SWITCH
⑤ ⑦	VOLUME UP
⑥ ⑧	VOLUME DOWN

FIG. 6C

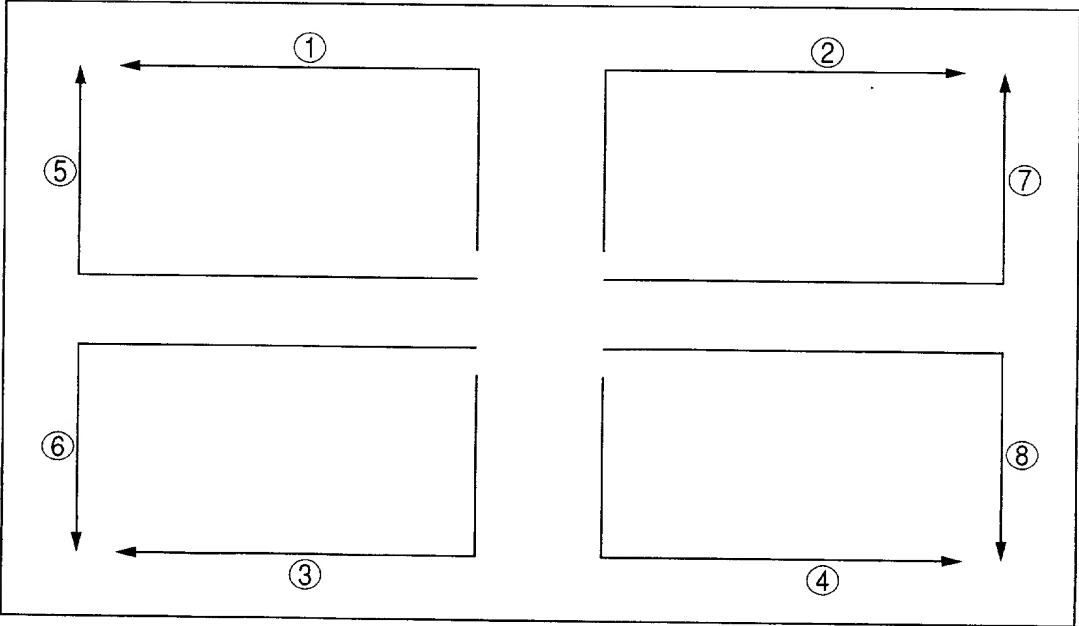
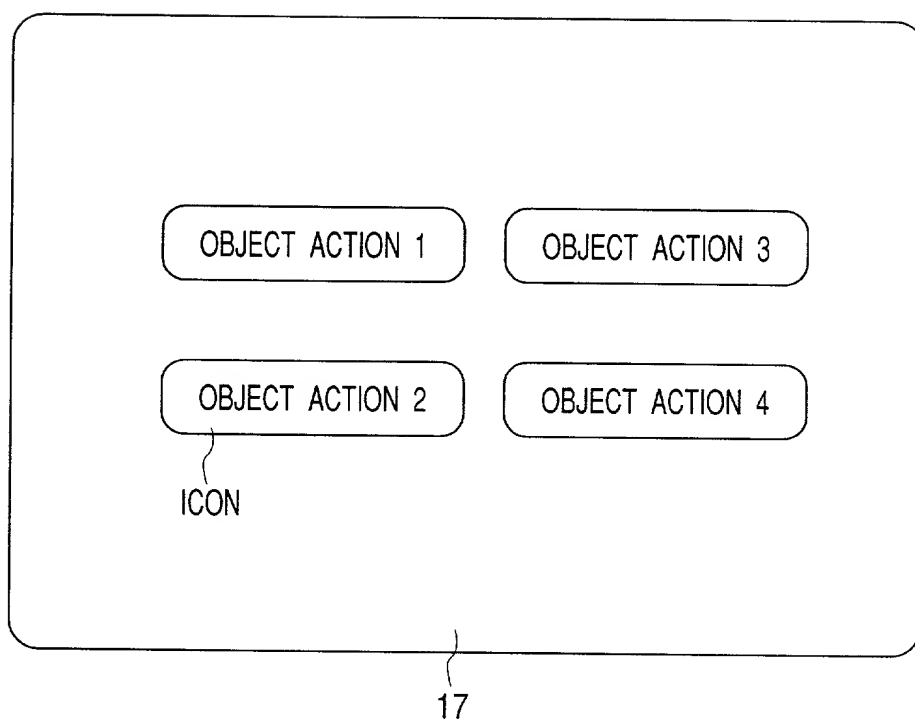


FIG. 7

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY
(Includes Reference to PCT International Applications)

Attorney Docket No:

As a below named inventor, I hereby declare that:

My residence post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **GROPING OPERATION APPARATUS**

the specification of which (check only one item below):

☐ is attached hereto.

☐ was filed as United States application

Serial No.

on

and was amended

on _____ (if applicable).

☒ was filed as PCT international application

Number **PCT/JP00/08343**

on **November 27, 2000**

and was amended under PCT Article 34

on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations. § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate or of any PCT international applications(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
Japan	Patent Appln. No. 11-334367	25. 11. 99	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO

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I hereby claim the benefit under Title 35, United States Code, § 119(e) or § 120, as applicable of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56 which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

U.S. APPLICATIONS		STATUS (Check one)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED
PCT APPLICATIONS DESIGNATING THE U.S.				
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)		

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

The undersigned hereby authorize any U.S. attorney or agent named herein to accept and follow instructions from Nobuaki KATO and Nobumitsu ASAH as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney or agent and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorneys or agents named herein will be so notified by the undersigned.

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RESIDENCE (City, State & Country)		CITIZENSHIP	
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RESIDENCE (City, State & Country)		CITIZENSHIP	
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RESIDENCE (City, State & Country)		CITIZENSHIP	
POST OFFICE ADDRESS (Complete Address including City, State & Country)			